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Patent Claims

1. An internal combustion engine (1) having an exhaust-gas purification system, comprising a nitrogen oxide storage catalytic converter (4; 4a, 4b) and an SCR catalytic converter (5) connected downstream of the nitrogen oxide storage catalytic converter (4; 4a, 4b), in which the nitrogen oxide storage catalytic converter (4; 4a, 4b) can be supplied
   - in a first operating mode (I) with exhaust gas containing an excess of oxidizing constituents, with the nitrogen oxide storage catalytic converter (4; 4a, 4b) removing nitrogen oxides from the exhaust gas by accumulating them,
   - in a second operating mode (II) with exhaust gas containing an excess of reducing constituents, nitrogen oxide which has been stored in the nitrogen oxide storage catalytic converter (4; 4a, 4b) being at least partially reduced to form ammonia, and
   - in a third operating mode (III), which in terms of time is established after the first operating mode (I) and before the second operating mode (II), with an exhaust gas which has a lower content of oxidizing constituents than the first operating mode (I) and a lower content of reducing constituents than the second operating mode (II).

2. The exhaust-gas purification system as set forth in claim 1, characterized in that the nitrogen oxide storage catalytic converter (4; 4a, 4b) is designed as an arrangement of a first nitrogen oxide storage catalytic converter element (4a) and a second nitrogen oxide storage catalytic

converter element (4b) which is connected parallel in terms of flow with the first nitrogen oxide storage catalytic converter element (4a).

3. The exhaust-gas purification system as claimed in claim 2, characterized in that the first nitrogen oxide storage catalytic converter element (4a) and the second nitrogen oxide storage catalytic converter element (4b) can be operated alternately either in the first operating mode (I) or in the second operating mode (II) and third operating mode (III).

4. The exhaust-gas purification system as claimed in claim 2 or 3, characterized in that a switching device (6) is provided, in such a manner that the nitrogen oxide storage catalytic converter element (4a; 4b) which is operating in the second operating mode (II) and/or in the third operating mode (III) can be at least partially isolated from the exhaust-gas stream released from the internal combustion engine (1).

5. The exhaust-gas purification system as claimed in one of claims 1 to 4, characterized in that a gas delivery device (8) is provided, in such a manner that the nitrogen oxide storage catalytic converter (4a; 4b), which is operated in the second operating mode (II) and/or in the third operating mode (III), can be acted on by a gas stream delivered by the gas delivery device (8).

6. The exhaust-gas purification system as claimed in claim 5, characterized in that the gas delivery device (8) can deliver a low-oxygen gas stream.

7. The exhaust-gas purification system as claimed in claim 5 or 6, characterized in that the gas

delivery device (8) is designed as a fuel reformer or as a burner.

8. The exhaust-gas purification system as claimed in one of Claims 1 to 7, characterized in that a catalytic converter element (7a, 7b) with an oxidation catalytic action is connected upstream of the nitrogen oxide storage catalytic converter (4a, 4b).

9. The exhaust-gas purification system as claimed in one of claims 1 to 8, characterized in that a particulate filter is connected upstream of the SCR catalytic converter (5).

10. A method for purifying the exhaust gas from an internal combustion engine (1) having an exhaust-gas purification system, comprising a nitrogen oxide storage catalytic converter (4; 4a, 4b) and an SCR catalytic converter (5) connected downstream of the nitrogen oxide storage catalytic converter (4; 4a, 4b), in which method the nitrogen oxide storage catalytic converter (4; 4a, 4b) is supplied

- in a first method step with exhaust gas containing an excess of oxidizing constituents, with nitrogen oxides being removed from the exhaust gas by being accumulated in the nitrogen oxide storage catalytic converter (4; 4a, 4b),
- in a second method step with exhaust gas containing an excess of reducing constituents, with nitrogen oxide which has been accumulated in the nitrogen oxide storage catalytic converter (4; 4a, 4b) being at least partially reduced to NH_3, and
- in a third method step, which in terms of time is carried out after the first method step and before the second method step, with an exhaust

gas which has a lower content of oxidizing constituents than in the first method step and a lower content of reducing constituents than in the second method step.

11. The method as claimed in claim 10, characterized in that the third method step is terminated at the earliest when the nitrogen oxide storage catalytic converter (4; 4a, 4b) has been predominantly filled by exhaust gas delivered in the third method step.

12. The method as claimed in claim 10 or 11, characterized in that in the case of a nitrogen oxide storage catalytic converter formed as a parallel arrangement of a first nitrogen oxide storage catalytic converter element (4a) and a second nitrogen oxide storage catalytic converter element (4b), the first nitrogen oxide storage catalytic converter element (4a) and the second nitrogen oxide storage catalytic converter element (4b) are operated alternately, via a switching device (6), in the first method step or in the second and third method steps.

13. The method as claimed in one of claims 10 to 12, characterized in that the exhaust gas which is supplied to the nitrogen oxide storage catalytic converter (4; 4a, 4b) in the second method step and/or in the third method step is at least partially delivered by a gas delivery unit (8) which is designed as a fuel reformer or as a burner.

14. The method as claimed in one of claims 10 to 13, characterized in that in the second and third method steps the oxygen content of the exhaust gas is catalytically lowered upstream of the nitrogen oxide storage catalytic converter (4; 4a, 4b).

15. The method as claimed in either one of claims 13 and 14, characterized in that the temperature of the nitrogen oxide storage catalytic converter element (4a, 4b) is influenced, according to the temperature dependency of its efficiency, by adjusting the switching device (6).